Interviewee: AWS_02

Name: Anonymous

Role / Title: Anonymous

Organisation: Anonymous

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Interviewer: Paula Goodale

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1 2	Q:	So I want to just start by-- if you could tell me a bit about yourself, your education, professional background and any leisure pursuits that are relevant to what we're talking about today.
3 4 5	A:	Okay. I suppose I'll start with education. I suppose I should start with background actually. I'm an American, which you may or may not be able to tell from my accent at this point, it's very soft.
6	Q:	I'd placed you in North America.
7 8 9 10 11 12 13 14 15 16 17 18	A:	Yeah. It's very soft now, but, erm, I spent my very youngest years in the US, then moved to Denmark for a few years, then back to the US for a few more years until after my freshman year of high school in the US, which is the equivalent of--, which is ninth grade or the equivalent of some silly year which I haven't learned in the UK system yet. And then went to--, moved to Sweden with my parents where I did the International Baccalaureate. So they had schools that had a one year introductory year and then two years International Baccalaureate. So from the point of general background it was quite--, a more international flex than average, because of the moving around. And for a similar reason my education has been very mixed and matched going from different countries because I also spent seven months in Finland shortly before moving to Sweden, but then once I finished the International Baccalaureate I came to Sheffield, did a four year Master's course in civil engineering and I just graduated last week with my PhD in civil engineering.
19	Q:	Fantastic, well done.
20 21 22 23 24 25 26 27 28	A:	So the course in civil engineering was, er, the broad civil engineering course that the university offers. So that covers structures, buildings, bridges as well as the waterside. So I've had courses in hydrology which is rainfall run off stuff, and I've had pipe networks, sewer networks, which is the water distribution and then the sewer network side covers also then rainfall--, more of the rainfall run off stuff. So I have familiarity with how the weather data that the Met Office collects end up back in engineering for the use of design purposes. Most of my PhD then was--, well my PhD was in water but I was looking particularly at modelling in sewers but I also did spend a chunk of my time looking at green roofs, which in civil engineering are classed as a single urban drainage system as a source control mechanism. Essentially you

29		put some grass on the roof, it soaks up the water so that it doesn't end up in the streets and in
30		the sewers is the basic premise and that brought me into contact again with some rainfall stuff,
31		but again on the analysis of rainfall data side not on the collection. Well we have rain gauges
32		in the engineering department, so I've dealt with data collection there as well.
33	Q:	Do they have a particular purpose or are they just there if you need them?
34	A:	It's so that we have the corresponding rainfall run off data for the green roof so that part of the
35		research that's ongoing and has been ongoing at Sheffield for the last few years has been
36		looking at modelling green roofs so we can predict what will happen if you put green roofs on a
37		chunk of London say, that sort of thing. So for predictive purposes, to try and make the case
38		or to better understand how the urban catchment changes as we add them to homes, to make
39		predictions for urban flooding and things like that, where the very small scale stuff is sensitive.
40		And so we have the rain gauges collecting data corresponding to our tests run off green roofs
41		and the run off data from roofs that we have data to which to build models from. That more or
42		less covers the stuff for education. In terms of my personal interests I'm very much a
43		computer person which has brought me into programming, electronics, the Raspberry Pi
44		computer and then I came across the AirPi weather station thing a while back and built two of
45		those. I've worked on that stuff--, sort of stuff as well. So I've got a professional ish
46		appreciation. I wouldn't count--, like a researcher appreciation to rainfall data and an
47		enthusiast's appreciation of the collection more because…
48	Q:	Okay, right. So we're talking to you today because you have professed to have a Raspberry
49		Pi weather station.
50	A:	Yes.
51	Q:	So what came first, the interest in the weather or the Pi?
52	A:	[Sighs] The interest in the computer came first. I wouldn't--, I didn't start doing the things I do
53		with the Raspberry Pi just because I got a Raspberry Pi. I've seen that sort of thing long
54		before even before I got really interested in engineering. The reason why I got the Pi was
55		because I already had that pre-existing interest and I thought this was a good platform for
56		further experimentation and growing my knowledge in electronics more, rather than in
57		computing, because there's very little you can do on a Raspberry Pi that you can't do on a
58		regular computer except for the electronics side and that's what really caught my interest there
59		as a nice way to go into electronics. And that got me then into, as an extension of electronics,
60		the weather station which I thought-- this matches very nicely with the other stuff that I've done
61		at this point as part of my Master's degree.
62	Q:	So how long ago was this, that you started thinking about, you know, weather and the Pi?
63	A:	Weather and the Pi would have been around, I don't know, November last year maybe.
64	Q:	Okay. So it's a fairly new endeavour.
65	A:	Yeah, several months and I know certainly--, certainly since before 2014.

| 66 | Q: | Have you ever had--, measured weather in any other way? Have you collected it through |
| 67 | | other, you know, more regular devices? |

68	A:	Just the rain gauges-- At the university as well and I've been involved with the data loggers we
69		used, which is a proper Campbell Scientific, very proper research system. I've been involved
70		in programming those for the data collection previously.

71	Q:	Okay. Right. That just gives me a little bit of an idea about your kind of background on it. So
72		around last November, you decided that you'd think about weather with the Raspberry Pi.
73		What happened then? Take me through it.

74	A:	I saw--, I was introduced--, I was sent a link to the AirPi project essentially and I thought this is
75		very me because it combines several of my previous interests in the form of the electronics,
76		the Raspberry Pi, the weather, programming, er, things I'd done during my degree course.
77		And I thought this seems like a very nice way to try meshing knowledge in a new way. And so
78		then I thought I'd build one, ordered the parts off the--, it feels like six different places I need to
79		get the parts from.

| 80 | Q: | Right. Was that a pretty impulsive decision or did you take time thinking about it and kind of |
| 81 | | researching it or did you just kind of go, "Right, that's what I'm going to do"? |

82	A:	I spent a bit of time looking at it. Erm, I was probably a bit more impulsive about it than I
83		would normally have been given the overall costs. I say overall costs, it's quite low on the
84		grand scheme of things, but as a student it's quite big. It feels, I try--, but because I'm doing
85		some--, some of the Raspberry Pi related stuff I do in conjunction with the professor in the
86		computer science department, and so I can talk to him and he'll order bits or he'll get--, we
87		have an arrangement.

| 88 | Q: | Yeah, sure. |

89	A:	And so I talked with him and he agreed that this would be a good way to look at the Raspberry
90		Pi in terms of things he's doing as well and so that let me get into it a bit more easily so I could
91		just ignore the cost essentially and focus just on the building and getting to grips with it.

| 92 | Q: | Okay. So what kit did you get? |

93	A:	So the AirPi project is essentially the collection of weather related sensors which you can mix
94		and match as you choose. I got everything that was feasible to get in the UK so it has air
95		pressure, temperature, relative humidity, light as in lux, then UV intensity and I have a rain
96		gauge myself. So that wasn't something the project actually recommended but because I have
97		my Master's stuff and PhD stuff relating to rain gauges I thought I must certainly add this and
98		that was a nice meshing.

| 99 | Q: | So did you--, was that something you figured out yourself or did you find, you know, help out |
| 100 | | there on the web on how to set up the rain side of things? |

| 101 | A: | Because I know [laughs]--, knew quite a bit about rain, how rain gauges already worked it was |
| 102 | | very--, it was comparatively easy. It was more a challenge integrating it into the AirPi |

103		software, then a harder challenge. I know about rain gauge placement and things like that
104		and so it was easier for me to connect it together.
105	Q:	Okay. So tell me about your set up. Where is it located and kind of…
106	A:	So I live in a shared student house here in Sheffield. It's a ground floor basement, first floor
107		and second floor. I live in the basement where I have a window which opens outdoors onto--,
108		and a door as well but I don't mess with the door as much. But I've got a window which opens
109		outdoors onto a patio which has a small table about this size but out of plastic, which the rain
110		gauge is sat on and there's a nice wire trailing up over my window down onto my window sill
111		where the Raspberry Pi and the rest of it sits. So I collect--, the rain gauge is the only bit
112		outside because it's the only bit I feel particularly happy about leaving outside, given that it's
113		quite an urban area and we do occasionally have random people wandering around in our
114		back garden. And so the Raspberry Pi then just sits on the window sill where it can get the
115		light but it does quite strongly get the light. So there's a lot of sunlight which messes with the,
116		er--, it doesn't mess with the light reading [inaudible 0:11:08], but it does mess with the
117		temperature and relative humidity quite badly because it does heat up on the window sill. So I
118		will record temperatures of 50 degrees in the sunlight.
119	Q:	Okay [laughs].
120	A:	And because relative humidity is dependent on temperature, relative humidity shoots down as
121		a result because it's messing with that reading, and so relative humidity plummets-- 20%
122		relative humidity, what's going on? Er, but that's generally the set up.
123	Q:	Okay do you--, so you program the software yourself. Do you use any external stuff as well?
124	A:	There was the software provided by the AirPi project and I was not hugely happy with the
125		software, so I spent quite a bit of time modifying the software to do the things I wanted it to do.
126	Q:	Okay, what kind of things did you modify it for?
127	A:	I added CSV logging so I could more easily post analyse the data. All the sensors--, the AirPi
128		software provided no platform for calibration so if you discovered that your--, for example, the
129		light sensor gives you--, is a light resisting diode, a light diode resister, LDR anyway, it's
130		basically a photosensitive resister where the brighter the light is the resistance changes. The
131		AirPi software originally recorded the resistance which isn't a linear relationship, with sunlight.
132		So that's a fairly useless reading to just look at to see because it just is so you need to
133		calibrate the data. So I added calibration, you know, for the different sensors that, like, a rain
134		gauge works by--, well the rain gauge I have is a tipping bucket rain gauge and so the bucket
135		tips and closes a switch, and you get a pulse. Counting the number of switch closures isn't
136		terribly useful, so you multiple that by point, I don't know, 239, I forget exactly, point 293. It's
137		some weird number because it's, like, a one sixteenth of an inch is the-- for the gauge.
138	Q:	Imperial.
139	A:	And so it turns to stupid metric units for that particular rain gauge. And so things like that for
140		the UV sensors, and so calibration. And then CSV is very good for post--, post analysis but I

141		wanted a real time display as well because that was something which I did part of my
142		Master's--, for my Master's thesis, I was dealing with real time display, data from a green roof.
143		And so I wanted a real time display for the AirPi as well. So I wrote a built in weather--, built in
144		HTTP server so you can go to a nice page and you click—and click on the temperature
145		reading and it gives you a graph for the last 24 hours. So you can quickly see what are the
146		trends in temperature. And trends in temperature are a little bit less than useful because
147		every time I opened the door, I opened the window, I open and close the curtains, things are
148		changing [both laugh]. So temperature's not-- but if you want to see the rain or the pressure
149		they're not dependent on temperature and so I can see pressure has been falling I maybe
150		want to pay more attention for rain or pressure is rising or pressure hasn't changed very much.
151		I mean I had a barometer on the wall like an old fashioned--,
152	Q:	Yeah, sure.
153	A:	In the room and I've used that. But now that's still there, but I don't use that as much as I
154		check the web page now, but I originally did have the barometer because I was getting quite
155		tired of the-- let's go check BBC weather, it's not right anyway, why do I bother? Because for
156		short term predictions I can generally get a good idea of what's happening off the barometer.
157	Q:	Yeah. So what frequency of observations are you taking?
158	A:	I've long had the philosophy that it's easier to record data and get rid of it later than not record
159		it so frequently because it's very hard to go back to data that you never had. So the data is
160		currently collecting at, I think, five second intervals--,
161	Q:	Gosh! That's pretty regular.
162	A:	But--, yeah, but if I want to go to minute or two minute readings it's quite easy just to drop the
163		data points or to do a moving average just make that noise or small term fluctuations. And so
164		from that point of view I'm much happier having the extra data and it's not--, it's not very space
165		intensive to be honest.
166	Q:	No. No, it's numbers so…
167	A:	I think I've got, like, a 200 megabyte file for the last six months so I know it's not going to kill
168		me. So it would start to kill me, you know, if I wanted to plot in Excel, because Excel has, like,
169		so many lines and then the data file I've got is probably, you know, so many lines again times
170		the length. But, I've been using MatLab as part of my university work and so I'd be quite happy
171		if it was in MatLab. Octave is what I use at home, because I have a licence at home, and you
172		can't use [inaudible 0:16:10] to connect to the university VPN, and eventually I will have to use
173		the university VPN potentially. And so I'm happy enough to read in the data files, do plots and
174		things that way.
175	Q:	Yeah. So they're CSV when they come off. Do you do anything else to them? Do you just
176		use them in their raw state and then feed them into the stats software?
177	A:	Erm, let's see. The CSV currently records the un-calibrated data so if I was going to do any
178		post analysis I would have to go back and recalibrate but that's in--, for the same reason that it

179		collects more frequently it's much easier to collect un-calibrated and calibrate it than discover
180		that you have calibrated incorrectly and you need to go back because that could be
181		problematic later on. I've hit similar problems like that before.
182	Q:	Did you have a routine for that, you know, the calibration side of things? Do you just--, do you
183		have a set kind of things that you do each time you'd want to use the data or is it--, it's un-
184		calibrated, it's calibrated and you save it and it's …
185	A:	Er, I suppose I should start by saying that I haven't actually run--, really run any data analysis
186		yet. I've mostly been using the real time display, and for the real time display it does the
187		calibration on the fly. When I have a power blip or accidently unplug the Raspberry Pi it loses
188		the cache memory of what's happened over the last 24 hours and so then it re-reads in the
189		CSV file, reapplies the calibration and then keeps the last 24 hours of that data. And so I
190		suppose from that point of view I'm always re-calibrating each time I use the data. But
191		because I haven't actually sat down yet to do any proper analysis to it I'm waiting to get the
192		next trend. I mean, because you see quite nice things, a yearly trend because you have
193		seasonal fluctuant variations and you can do deseasonal trending. And so I imagine that
194		maybe at some point I'll feel excited to look at, you know, how does temperature in my room
195		vary and, you know, can I automatically detect when windows and doors have been open and
196		things, because I know there's dependency on that. So that might make some interesting data
197		analysis but I just haven't--, I spent so much time writing the software [both laugh] and getting
198		to a nice stopping point there that I've just been letting it sit for the last few months just
199		collecting data to come back to later.
200	Q:	Okay. So--, so in that case then, do you have any plans for that data? Is it--, I mean I
201		understand from weather data, you know, you need a good long period before you can do
202		something interesting with it, but--, and you're getting up to, what, eight months now,
203		something like that? Seven or eight months.
204	A:	I've only actually managed actually to have it recording since January. So it's six or seven
205		months at this point. I don't have any definite plans because for me that weather station is
206		hobby territory, not must absolutely do it work territory. And so I'm just sort of enjoying the
207		graphs and the nice little--, I've got a little thing on my desktop of my PC which shows the
208		latest readings there as well. So I've got a nice little thing in the corner of my screen, you
209		know, other Windows stuff go on top of it. It's very not there if you're not looking for it but I've
210		got--, and I'm just sort of enjoying those things and be able to, you know, check, you know, it's
211		been raining what does the rainfall look like? Because I suppose one of the things I'm most
212		interested about it is the rainfall side, because that does tie in more to what I've done as part
213		of my degree. Particularly what's interesting is the shape of rainfall because from the design
214		point of view, which is where I've mostly used rainfall data as part of my Master's degree,
215		rainfall is designed--, and this seems to be part of essentially Gaussian distribution with
216		different amounts of peakiness depending on whether you're seeing a summer or winter
217		storm, 90%profile, and the different shapes of storms, but that's how they're done in the UK.
218		As part of my PhD I spent a year in Germany, and there we found they use a different shape

219		of design for rainfall, they use what's called [inaudible 0:20:12] type two, which essentially they
220		distribute their rainfall for design purposes in a Gaussian profile, and they take the last third of
221		the Gaussian profile and they stick it around back to front, so you get sort of a short intense bit
222		that decreases in intensity, then a really intense bit increasing in intensity, compared to this
223		sort of increase and decrease that you get from the Gaussian profile which they use in the UK.
224	Q:	So there are different standards, yeah.
225	A:	Right, and so I was quite then interested to see how does the latest rainfall that we've just had
226		when we've had a good, you know, a few millimetres compare to how you might potentially
227		design a similar rainfall, and what that might mean for the design of things like sewers,
228		reservoirs. We haven't really had intense enough rain since I've been collecting. The
229		reservoirs duly come into play.
230	Q:	Well not up here.
231	A:	No [laughs].
232	Q:	No, if you'd moved down South in the first quarter maybe you would have interesting data.
233		Okay. So you're just storing the data at the moment, you're viewing it as it's live and you're
234		storing it for later. Okay. Do you upload it anywhere or share it with other people?
235	A:	No, not at the moment.
236	Q:	No. Do you have any plans for that?
237	A:	I hadn't really until I got involved with Romilly's project, at which point I [inaudible 0:21:35] the
238		Met Office. I have been considering doing that for the things which I know wouldn't be
239		affected by the sunlight so that's particularly with the pressure and for the rainfall but also
240		means I do have to write then the software model to do that. And it's not hugely complex I just
241		haven't got into the right frame of mind where I'll sit down and write this bit of software today.
242		So I haven't done it, but in the future I suppose I would be interested in doing that because it
243		does seem like an interesting…
244	Q:	Sure. I mean did--, what would be your motivation behind that? Would it be just I have got
245		some data someone else may as well use it or is there a kind of a--, any kind of philosophical
246		position on openness and…
247	A:	I'm not hugely--, I like open sort of software but I'm not an evangeliser. I will advocate its
248		benefits like this is free, because there's a guy in my work room who I sit next to and he's
249		always using Adobe Illustrator and I'm always using Inkscape. And I was ribbing him about
250		using Illustrator which would cost normally quite a lot of money. Inkscape is free, but he's got,
251		you know, the student package where it's quite affordable for Adobe, but that's the sort of
252		thing I--, [laughs] the approach I take to--, in terms of open sort of software. And that sort of
253		translates to how I view data that I've collected to some extent, because most of the time
254		when I do write software if I think it's of any value I will make it open source in some way, or
255		put it on a website or something. I've been involved in several open source projects. The
256		data I've just--, the motivation for sharing the data I suppose would just be a cross between--,

257		it's along the lines of a cross between something along the lines of-- I've got it I might as well
258		share with--, crossed with, er, trite, but sharing is caring sort of thing. It's you do get a little bit
259		of a… not jolt, but boost, or you get a little visceral pleasure of sharing and helping other
260		people out and it would come under that. That's the same reason why I've put this data in a
261		lot of forums and stuff as well and I've…

| 262 | Q: | Is this Raspberry Pi forums or… |

| 263 | A: | I've done Raspberry Pi forums, other forums. It's--, it comes and goes in phases. |

| 264 | Q: | So is that you looking for information, or you sharing information and… |

265	A:	I like sharing that sort of information. It's part of the same reason why I'm here doing the
266		interview is because it's a good chance to share and, you know, plus some of your views and
267		understand a little bit about--, more about the research you're doing based on the interview
268		questions and your responses to my responses and things like that which is all a bit-- But in
269		terms of forums then I mostly just--, you know, I'll see it and for some reason I'll get into it and
270		I'll spend a bit of--, you know, a few weeks/months helping random people out. And then
271		maybe I get tired or something, I'll pull up and I'll forget and then sort of end up in this
272		unfortunate position where it's-- I know there will be so much to reply to and so it falls off the
273		end of the earth which--, and eventually I'll come back to it again.

274	Q:	Yeah, sure. Okay. So I just want to go back a step. So the overall thing of having the
275		Raspberry Pi and the weather station and the data-- What do you enjoy about that? What's
276		important about it for you? You mentioned it's a hobby, it's--, but it's potentially…

| 277 | A: | Yeah, it's--- it's kind of my version of art. |

| 278 | Q: | Okay! That's an interesting perspective. |

279	A:	People--, people paint as creative expression, my creative expression is a bit more logical in
280		terms of programming. You know, I always quite enjoyed Lego as a kid and, erm, specifically
281		what I enjoy is the constrained solution. So if you're trying to do something and you have
282		these resources how can you best do what you're trying to do? And so building the weather
283		station isn't so much--, it's kind of a subset of that but it's why I get into a lot of programming of
284		electronics. I got this neat idea how can I do it with what I already have, or getting the least
285		amount of stuff possible off eBay and things like that. And so the Raspberry Pi weather
286		station is just another version of--, I mean in this case I didn't have to worry too much about
287		getting the components, but it's a project along that some sort of line. So I was interested in
288		doing it.

289	Q:	Okay. Do you--, so are there any kind of challenges and frustrations that would sort of say,
290		"Well no, I've had enough of this now I don't want to continue with it"?

291	A:	If the programming got really, really tedious I would--, I would stop. I mean--, or let it sit until I
292		got into it. I mean there are different projects I've done and there are things I've let sit for
293		years and I come back to and that sort of thing. I mean at the point it is now the weather
294		station is at a really good stopping point. It's functional, it does pretty much exactly what I

295		envisioned it to do at the start. There may be one or two minor bugs in the software and I just
296		haven't gotten around to messing with those. I know there's that at least there's a header
297		problem with the built in web server I created with the last modified header. I know there's--,
298		I've got two little files on my desktop--, I use my desktop like a post it note board, the
299		computer, and so I've got two little files saying 'you have to fix it' or 'there's this and this which
300		should be looked at at some point', but they're not really showstoppers. I'm pretty happy with
301		how it is and so because I got quite happy and I was sort of entering into a stability test phase,
302		because I have the software more or less done and I want to see does it all run properly. And I
303		sort of got to that point and it's just it's still running properly, this is great [both laugh].
304	Q:	So okay, so I mean--, so do you envisage it just sitting there for the foreseeable future or
305		what? What will happen if you move?
306	A:	Well if I move first I'll have to pack it up, then I'll have to see if I can keep it because I didn't
307		actually buy it myself. So that will be the first bit. Assuming I kept it I would then probably set
308		it up again wherever I moved to. Erm, well I mean I would like to be able to put it outdoors. I
309		do have a rough plan for how I'd put it outdoors which involves--,
310	Q:	Tell me about that then.
311	A:	Which does involve sandwich boxes essentially.
312	Q:	Okay, like little plastic…
313	A:	Tupperware. Yeah, with a seal because if you--, and then very long wires leading from
314		outdoors to indoors because you can't--, the big problem with putting it outdoors has always
315		been twofold--, threefold. Heat is a big problem outdoors. It said you have to put it in the
316		shade if you want to do it properly as a weather station. Erm, and from the same heat problem
317		is then that if you wanted to put the Raspberry Pi in with it, you couldn't have the Raspberry Pi
318		in the same container as the temperature sensors, because the Raspberry Pi does generate
319		heat, and in a completely enclosed environment you would have a nice bit of insulation which
320		means you'd get very poor temperature readings which would affect your relative humidity.
321		The relative humidity is another problem because you actually do technically need airflow for
322		that, which means you can't have a completely sealed container. But weatherproofing is a very
323		tricky thing with the different IPC standards, I've not quite completely solved. The problem I
324		have is how I deal with the weather-proofing from that point of view which means putting it
325		outside-- It's something I'm still sort of playing about--. I've been trying to think, you know,
326		what can I do to the sandwich container? Could I cut slits in it and then put some sort of foam,
327		synthetic in? You know, what's the matinal length of lead I can put it on before you get signal
328		degradation to the Raspberry Pi?
329	Q:	So it's another little project, isn't it?
330	A:	It's almost a project in itself to put it outdoors unfortunately. And so I've not--, so it's still one of
331		the things which I'm planning and waiting to have that really good idea or to come to

332		something which I know which I can carry out with the things I have because that's the
333		constraint to the problem.
334	Q:	Yeah, sure. Yeah.
335	A:	And so I'm…
336	Q:	So okay, I mean have you thought about bringing it into your work environment and into the
337		Mappin building?
338	A:	I have because the Mappin building uses a really old heating system.
339	Q:	Yes, I'm familiar with it.
340	A:	Which is very--, which is very, erm, poorly tuned for room temperature and often during the
341		winter the roof up my end will be at 28 degrees [both laugh], er, which is less than ideal.
342	Q:	Yes.
343	A:	It's cooler in the summer. I mean there was one winter when I just had my PhD written and I
344		was wearing shorts into the office because it was too warm during the winter. So there is
345		another guy in there who does have a temperature logger for his--, one of the little USB ones,
346		just monitoring room temperature and you can go to a website right off his computer and, "Can
347		you can check the temperature in the room?" and just see--, watch it climb and climb. And
348		then you open the window and watch it fall and so I have thought about it but, erm, PAT is
349		very annoying. I'm not sure how thrilled the--, because we're now next door to the electrical
350		office, electrical computing office for civil engineering and in general I'm not sure how thrilled
351		they'd be the next time they came through to do PAT testing to see a bread board lying around
352		a power dock--, because that's sort of not hugely in line with PAT I imagine. And they're quite
353		big on health and safety in the UK.
354	Q:	They are, yeah, yeah. They're probably not too keen on little homemade electronics [both
355		laugh].
356	A:	So well--, and so it will probably be okay and I could probably do it short term but--,
357	Q:	Right, but it's not practical at the moment.
358	A:	It's probably not practical and you can't really collect all the data where we are for--, I mean
359		we're on the north side of the building, so from that point of view--, but, you know, leaving it on
360		the window sill of a third floor and the outdoor window sill it would be another bit of PAT upset
361		and there's no good place to put the rain gauge and so, erm…
362	Q:	Yeah. Okay. Okay. You mentioned that you'd been kind of involved in a little bit in forums,
363		do you actually kind of interact with any kind of amateur meteorologists, you know, through
364		other media? Through…
365	A:	No.
366	Q:	You don't go to meets or Raspberry Pi meets or anything like that?
367	A:	I do go to the Raspberry Pi Jams occasionally.

368	Q:	Okay. Have you done weather at one of those?
369	A:	No. Not yet. Erm, there was in Manchester the something something something a few months
370		back, the Raspberry Pi Jamboree, that was it. I did go and I did show the weather station
371		there but that was more of a--, that wasn't really a Raspberry Pi Jam that was more like a mini
372		conference type event.
373	Q:	Okay. Did you get some feedback? What did people think?
374	A:	There weren't really very many comments on it in the end. Erm, people were interested I
375		suppose as anything else about it as anything else on the table because it wasn't just showing
376		off the weather but it was, you know, all the different projects.
377	Q:	Yeah.
378	A:	And so there wasn't--, there wasn't a huge amount of feedback on it specifically. There were a
379		few people who expressed interest. There was a guy from Manchester University who spoke
380		to me about it but nothing else really sticks in my mind.
381	Q:	No, okay. So do you--, I mean what other Raspberry Pi projects have you got on the go?
382		Anything?
383	A:	Erm, not--, well currently I'm working on-- battery and solar power is the project I'm currently
384		actively pursuing. I'm currently…
385	Q:	Is that to generate power?
386	A:	No, to--, like how long it lasts on battery power.
387	Q:	I see, yeah.
388	A:	How long it lasts on battery power supplemented with solar power. Having our sunny period
389		for however long it lasts. And so, you know, you can double the length of the battery if you
390		have a sunny day, things like that. And so currently I've got a Raspberry Pi powered off 72
391		AAs which is quite a lot of AAs.
392	Q:	72, gosh. Yeah, how do you--, so you've got them in a little box or something or how does it
393		work?
394	A:	Well you know the--, like the connector for a nine volt battery?
395	Q:	Yeah.
396	A:	You can get things which hold AAs and they have that connector on it, so I've got nine things
397		that hold eight AAs with those connectors and I've got alligator leads connecting them together
398		and then connected to the Pi.
399	Q:	Wow! And is it working? Is it…
400	A:	Yes. It's been on for three days now.
401	Q:	Wow!
402	A:	I expect to get around seven give or take.

403	Q:	So these batteries are they--, are they rechargeable?
404	A:	Yes. 1.2 volt nickel–metal hydride.
405	Q:	Wow!
406	A:	It took a very long time to charge them all.
407	Q:	[Laughs]
408	A:	Yeah, it will be a very long time to charge them all afterwards.
409	Q:	Interesting, and so anything else or is it…
410	A:	That's what I'm doing--, most recently after that I was working on my homemade 3D TV
411		project again which was something I worked on originally, er, late last year or January this
412		year, around the turn of the year anyway. And the idea was that originally that I've--, a
413		previous project before that one having to hook up a little LCD screen sort of like that to the
414		Raspberry Pi so you display whatever I want to display on it. And then after I got it to display
415		text I thought could I do video? It turns out you can do video, and, er, you can actually display
416		quite high refresh rate video and so I recorded--, and I worked out that I could display about
417		125 frames per second
418	Q:	Wow!
419	A:	Which is…
420	Q:	That's not too bad.
421	A:	No, it's not, because considering normal 3D TV is 120 hertz I thought 120 I could time it to be
422		120 could I then do what's called active 3D TV which is where you have glasses that block
423		one eye and block the other eye rather--, like in the cinemas they use polarising which is the
424		real 3D so you'd have glasses with the polar and that's how you get it there. And so I thought
425		could I build this with my electronics? And so I figured out--, I found a pair of glasses, figured
426		out how to control them and then couldn't get it to work anymore after that. Er, I couldn't figure
427		out exactly what the problem was but my current theory still is the response time of the screen.
428		So I can display the data that quickly, how quickly the pixels turn on and off is a chemical
429		reaction, liquid crystal, and that's probably actually quite slow considering it's a £5 LCD screen
430		off--, like that off eBay. And so I figured that where you can display the whole video you can
431		get very nice smooth video effects because of this that it doesn't switch back and forth
432		between--, so you get sort of pseudo grey scale as a result when you're trying to switch back
433		and forth rather than actual 3D. It doesn't turn on and off quickly enough. So the project was
434		shelved and then I came back to it with I thought well why do I have to use the little LCD
435		screen? Why can't I use a regular monitor because regular computer monitors now have two
436		millisecond response times which, if you do the math, for 120 hertz and that's how they can do
437		proper 3D TV, but of course I don't have 120 hertz monitor because otherwise I'd just be doing
438		normal 3D it wouldn't be very homemade. So I thought I can control the glasses, connect
439		control them down to 60 hertz which is what a regular monitor is and, you know, you

440		potentially risk the risk of headaches whatever but with some of the 3D you risk that anyway.
441		It turns out that no, you can't get the glasses down to 60 hertz [both laugh]. You can get them
442		to 61.3 hertz.
443	Q:	Right.
444	A:	And then there's some auto shutoff on them which means they stop responding and so that
445		didn't work, but then I realised [laughs] not all monitors do 60 hertz, some monitors do 75 hertz
446		which is within the realms of the glasses and, you know, potentially work. And so I got it to
447		nearly work [both laugh] except the circuit for controlling the glasses experiences some sort of
448		hiccup randomly which desyncs the glasses and, in the end, you can't get--, I haven't been
449		able to get it to properly match up with what's happening on the screen. So you can watch it
450		phase in and out with the glasses on, you can see it switch between which eyes are showing
451		which side of the image which isn't quite exactly what's supposed to happen. So until I can
452		find something like an oscilloscope to work out what's happening in the controller that controls
453		the glasses that project is on hold again. Er, but yes, so that was another project I've done
454		recently.
455	Q:	So you're a dabbler?
456	A:	Yeah, I do what seems interesting at the time.
457	Q:	Yeah, interesting. Okay. So I've only got a couple of other things. Erm, have you--, you
458		know, I get the sense that you've not gone out there and kind of evangelised about your
459		weather station.
460	A:	No.
461	Q:	You've been to the Pi Jam but it's just been a little--, you're not kind of trying to get other
462		people to set up weather stations and stuff like that.
463	A:	Not really. I've written some blog posts about what I've done and about the software. I made
464		the software changes that I've made freely available.
465	Q:	Do people contact you through that?
466	A:	I've had one or two small contacts asking about things like the calibration and that's kind of an
467		important bit, er, but I haven't--, I'm not pushing it on people.
468	Q:	Yeah, okay. And what interested you then get involved in the, er, weather station project here
469		in the Information School for what's it called? Festival of the Mind.
470	A:	Erm, the guy I work with in computer science was talking to Jo, and then Jo got in contact with
471		me. I thought this ties in with things I've done and it also additionally gives me some
472		experience more from the organise and research perspective which I think--, because I do--,
473		my plan is to become an academic. So I've done my PhD and my plan is now to continue
474		doing a post doc and then to move on to lectures. You know the sort of usual academic-- So I
475		figure the experience I can get for, you know, mentoring Romilly and organising that bit of the
476		research was good experience to get. So I was interested in just anything that tied in with the

477		existing interest with the weather, the rainfall. It was just tying lots of things together again
478		with adding that little bit new to--, which I think is the hallmark of a good learning experience.
479		And so that's what I was…
480	Q:	And how do you think it's gone?
481	A:	Pretty well. I think Romilly has been really good [both laugh].
482	Q:	Have you had a go with the instructions that she's created?
483	A:	I haven't sat down and actually properly followed them but I've read them, I have looked at the
484		pictures and they do seem quite good. Nothing has popped to mind when I've been reading
485		them but I do--, I would consider one of my faults is I'm very good at taking things as read and
486		making the gaps and assumptions between what's been said and what actually needs to be
487		done which can both be a plus and a minus. So for things like speed reading it's quite good,
488		for things like critical review of academic papers it's maybe not as good, but I have to push
489		myself in that sense then when I'm reading papers, like do these people really know what's
490		going on? And it's something I have to keep in mind, but, erm, I think she's done some pretty
491		good work.
492	Q:	I can vouch that it works because I've had a go last week [laughs]. Okay. And just so one last
493		thing, so we're classing you as a citizen scientist in that you're creating this data and you're
494		not sharing it too much at the moment but you may in the future. Erm, are you involved in
495		anything else that would be classed as citizen science? Do you get involved in any of the
496		Zooniverse projects, or anything like that? How do you feel about that kind of thing?
497	A:	Well I think citizen science for me is sort of a new term but there are other things which I know
498		of which I'd class as sort of very similar to citizen science. So, like, erm, people who do
499		[pause], what's it called? Can't even remember what the other thing is called. Erm, there are
500		people who do what's the word? Something, something gardening. Not urban.
501	Q:	Where they go out and sprinkle seeds on grass verges, that kind of thing?
502	A:	Yeah, people who, like, plant vegetables in the middle of the city stuff. There's a name for that
503		sort of thing.
504	Q:	I know the kind of thing you mean, yeah.
505	A:	To me that sort of falls in the same mental umbrella to some extent.
506	Q:	Right, yeah. Is that something that, you know, are you more attracted to the kind of practical
507		side of things or…
508	A:	Not--, I'm attracted to the problem solving side of whatever. So logistics as a practical event
509		or, you know, programing as a [inaudible 0:43:54]. To my mind I apply the same toolkit or skill
510		set in either case. So I see quite oddly things as related and I'm always looking for those sorts
511		of relations when I encounter something, er, but for me I wouldn't class too much of what I do
512		as citizen science. I mean the Raspberry Pi stuff that I write about, you could count, you
513		know, educational science or, you know, it's kind of--,

514	Q:	Science communication.

515	A:	The same thing but not exactly, you know, stuff that I--, you know, when I program I make
516		something open source, citizen computer science maybe, I don't know. It's-- I get the feeling
517		that when you say citizen science to me I kind of also get the impression that you may be
518		thinking more along the lines of citizens doing work that can then be translated to academic
519		research which…

520	Q:	To some degree. I mean we're kind of interested in different interpretations of it actually
521		because we have looked at citizen science from the point of view of people transcribing
522		weather data from archival material. We've looked at it from the point of view of people having
523		a weather station in their back garden and feeding their data in to the Met Office. There's
524		some others that get involved in just allowing their computer--, distributed computing to run
525		some climate models which has no involvement whatsoever.

526	A:	Climate prediction.

527	Q:	Yeah, yeah, that kind of thing. So there's a whole lot of different…

528	A:	There's been a lot of models.

529	Q:	There's a lot of different type of contributions that can be made and actually the open source
530		thing we haven't really looked at, so that's quite interesting to know about.

531	A:	Yeah, well I suspect that a lot of--, I won't say a lot but there are probably quite a few people
532		like me who are approaching something like building the AirPi, not because they're terribly--,
533		no, that's the wrong word. They're approaching it because it's got similar work to what they do
534		professionally. So I'm more interested in AirPi probably than I would be otherwise because of
535		the rain link to what I've done in my Masters and PhD. And I suspect that when you come
536		across things that are citizen science-y there are quite a few people who come and apply
537		toolkits from professional-- [inaudible 0:46:25]. Because I remember recently reading some
538		guy wrote a blog post about popular baby names and he analysed US census data or various
539		census data going back. He applied--, he's actually a--, or was at some point a chemist and
540		so in chemistry they have the thing where you burn off--, er, you burn a chemical compound
541		you're interested in and look at the hydrocarbons that come off and the size of them to try and
542		identify what the compound was. And so he used some statistical analysis on those results
543		and he applied that sort of analysis to the baby names to look at what defined trending as
544		terms of peak height and peak weight, because that is related to then the size of the carbons
545		that burn--, the results of burning off. And so he was doing--, I would class what he did as
546		potentially citizen science, but he was applying his professional knowledge to doing it and I
547		think-- that's where my view of citizen science is leaning towards.

548	Q:	There's certainly--, there's certainly a lot of that there--, out there but it comes in many
549		different forms. So it's just interesting to know how you perceive it. So I don't have any other
550		questions, is there anything else that you think would be interesting to know about you and
551		your Pi and your weather data?

552	A:	I can describe other Pi projects I've done still [both laugh], but, erm, as per regards specifically
553		to the weather, erm, yeah, the AirPi has an air quality sensor as well which I forgot to mention
554		before, which monitors, erm, generic air quality. It's sensitive to several compounds-- carbon
555		monoxide, nitrous dioxide, carbon monoxide.
556	Q:	Is that something you can use professionally? Or is it--, does it fit in with your green roof…
557	A:	Well it could. I'm in the wrong bit of the green roof. I mean I'm--, at the university I'm in the,
558		erm, hydrology, hydraulics, the water engineering side. Er, there are multiple benefits to green
559		roofs that class under--, so a lot of green roof research is actually disciplinary--,
560		interdisciplinary because you can look at the plants growing on it which is bio, you can look at
561		thermal insulation which essentially mechanical or civil, you can look at the soils on them
562		which is your technical. So there are lots of different bits you can analyse about it. So the air
563		quality side is not tied in with anything I'm doing at the university, but a sensor like that is--,
564		yeah, it isn't tied into anything I'm doing but it could be. I know that the guy I was talking to in--
565		at the jamboree from Manchester was actually most interested in the air quality sensor
566		because they're looking at air quality in Manchester and they're looking at--, or the plan is to
567		set up several quality--, air quality monitoring stations around Sheffield--, not Sheffield around
568		Manchester and then do some sort of large scale CFD modelling of the city looking at how air
569		quality moves around or something like that.
570	Q:	Interesting.
571	A:	Well I can imagine it to be a project like that. I don't have the exact details anymore because
572		you can--, you can do projects like that as well and so from that point of view then if you're
573		monitoring the quality data you could feed into something like that, but the actual specific--, the
574		very specific sensor I'm using because it's a very generic air quality sensor I still haven't
575		actually figured out exactly what the data means from that because it's sensitive to multiple
576		components. It's apparently also sensitive to humidity and temperature affecting the results
577		and so that's another one that I'm not too keen on [both laugh].
578	Q:	Back to your problem with the temperature.
579	A:	I still haven't--, I still haven't figured out on the whole how to interpret that one because that's
580		one where I just plot it as--, I found one paper that had--, they used the sensor as the--,
581		because the sensor cost, like, £5 and a professional proper sensor--, they were measuring
582		methane or something and a proper methane sensor costs, like, £300 or something. You
583		know, like all proper academic equipment it's astronomically--, well it's not astronomically
584		priced but it's getting up there and so they're looking at the reliability of the small sensor
585		compared to the proper sensor and whether or not they can use a small sensor in comparison
586		and they potentially found they could. They had a very nice calibration function as a function
587		of temperature, humidity which I have now applied to my sensor, erm, and so I have a
588		corrected [inaudible 0:51:04] reading. I still don't know what that means [both laugh]. I
589		haven't even worked out whether or not higher is better quality or lower is better quality. I
590		think higher is better but it's--, I'm not sure so from this point I'm still mostly ignoring that one--,

591 Q: It's a work in progress.

592 A: Until I get fed up with not understanding it or something and poke at it again to try and work
593   out what it means.

594 Q: Right, okay. That's great. I mean I've got more than enough there. So thanks ever so much.

595 A: Okay.

596 [END OF INTERVIEW]